

# TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID: TQ8-ADBB0D5AN

Equipment Under Test : DISPLAY CAR SYSTEM  
Model Name : ADBB0D5AN  
Variant Model Name : ADBB0A8AN  
Applicant : Hyundai Mobis Co., Ltd.  
Manufacturer : Hyundai Mobis Co., Ltd.  
Date of Receipt : 2018.01.02  
Date of Test(s) : 2018.01.11 ~ 2018.01.30  
Date of Issue : 2018.01.31

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Date:

2018.01.31

Jinhyoung Cho

Technical  
Manager:



Date:

2018.01.31

Harim Lee

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SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

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## 1. General Information

### 1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

-Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807

-Designation number: KR0150

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Phone No. : +82 31 688 0901

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### 1.2. Details of Applicant

Applicant : Hyundai Mobis Co., Ltd.

Address : 203, Teheran-ro, Gangnam-gu, Seoul, 06141, South Korea

Contact Person : Choe, Seung-Hoon

Phone No. : +82 31 260 0098

### 1.3. Details of manufacturer

Company : Same as applicant

Address : Same as applicant

### 1.4. Description of EUT

|                      |                                   |
|----------------------|-----------------------------------|
| Kind of Product      | DIGITAL CAR AVN SYSTEM            |
| Model Name           | ADBB0D5AN                         |
| Variant Model Name   | ADBB0A8AN                         |
| Power Supply         | DC 14.4 V                         |
| Frequency Range      | 2 402 MHz ~ 2 480 MHz (Bluetooth) |
| Modulation Technique | GFSK, $\pi/4$ DQPSK, 8DPSK        |
| Number of Channels   | 79 channels                       |
| Antenna Type         | Dielectric Chip Antenna           |
| Antenna Gain         | -0.10 dBi                         |

### 1.5. Test report revision

| Revision | Report number        | Date of Issue | Description |
|----------|----------------------|---------------|-------------|
| 0        | F690501/RF-RTL012297 | 2018.01.31    | Initial     |

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## 2. RF Exposure Evaluation

### 2.1. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

#### LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency Range<br>(MHz)                                | Electric Field<br>Strength(V/m) | Magnetic Field<br>Strength<br>(A/m) | Power Density<br>(mW/cm <sup>2</sup> ) | Average Time     |
|---------------------------------------------------------|---------------------------------|-------------------------------------|----------------------------------------|------------------|
| (A) Limits for Occupational/Controlled Exposure         |                                 |                                     |                                        |                  |
| 0.3-3.0                                                 | 614                             | 1.63                                | *100                                   | 6                |
| 3.0-30                                                  | 1842/f                          | 4.89/f                              | *900/f <sup>2</sup>                    | 6                |
| 30-300                                                  | 61.4                            | 0.163                               | 1.0                                    | 6                |
| 300-1 500                                               | -                               | -                                   | f/300                                  | 6                |
| 1 500-100 000                                           | -                               | -                                   | 5                                      | 6                |
| (B) Limits for General Population/Uncontrolled Exposure |                                 |                                     |                                        |                  |
| 0.3-1.34                                                | 614                             | 1.63                                | *100                                   | 30               |
| 1.34-30                                                 | 824/f                           | 2.19/f                              | *180/f <sup>2</sup>                    | 30               |
| 30-300                                                  | 27.5                            | 0.073                               | 0.2                                    | 30               |
| <b><u>300-1 500</u></b>                                 | -                               | -                                   | <b><u>f/1500</u></b>                   | <b><u>30</u></b> |
| <b><u>1 500-100 000</u></b>                             | -                               | -                                   | <b><u>1.0</u></b>                      | <b><u>30</u></b> |

#### 2.1.1. Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where  $P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

G = gain of antenna in linear scale

$\pi$  = 3.1416

R = distance between observation point and center of the radiator in cm

$P_d$  the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

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**2.1.2. Test Result of RF Exposure Evaluation**

Test Item : RF Exposure Evaluation Data

Test Mode : Normal Operation

**2.1.3. Output Power into Antenna & RF Exposure Evaluation Distance****Bluetooth****- Maximum tune up tolerance**

| Frequency Range<br>(MHz) | Output Average<br>Power to Antenna<br>(dB m) | Antenna<br>Gain<br>(dB i) | Power Density<br>at 20 cm<br>(mW/cm <sup>2</sup> ) | Limits<br>(mW/cm <sup>2</sup> ) |
|--------------------------|----------------------------------------------|---------------------------|----------------------------------------------------|---------------------------------|
| 2 402 ~ 2 480            | 4                                            | -0.10                     | 0.000 488                                          | 1                               |

**CDMA - BC0****- Maximum tune up tolerance**

| Frequency Range<br>(MHz) | Output Average<br>Power to Antenna<br>(dB m) | Antenna<br>Gain<br>(dB i) | Power Density<br>at 20 cm<br>(mW/cm <sup>2</sup> ) | Limits<br>(mW/cm <sup>2</sup> ) |
|--------------------------|----------------------------------------------|---------------------------|----------------------------------------------------|---------------------------------|
| 824 ~ 849                | 25                                           | 0.89                      | 0.077 220                                          | 0.55                            |

**CDMA - BC1****- Maximum tune up tolerance**

| Frequency Range<br>(MHz) | Output Average<br>Power to Antenna<br>(dB m) | Antenna<br>Gain<br>(dB i) | Power Density<br>at 20 cm<br>(mW/cm <sup>2</sup> ) | Limits<br>(mW/cm <sup>2</sup> ) |
|--------------------------|----------------------------------------------|---------------------------|----------------------------------------------------|---------------------------------|
| 1 850 ~ 1 910            | 25                                           | 3.20                      | 0.131 441                                          | 1                               |

**LTE - Band 4****- Maximum tune up tolerance**

| Frequency Range<br>(MHz) | Output Average<br>Power to Antenna<br>(dB m) | Antenna<br>Gain<br>(dB i) | Power Density<br>at 20 cm<br>(mW/cm <sup>2</sup> ) | Limits<br>(mW/cm <sup>2</sup> ) |
|--------------------------|----------------------------------------------|---------------------------|----------------------------------------------------|---------------------------------|
| 1 710 ~ 1 755            | 25.70                                        | 1.43                      | 0.102 738                                          | 1                               |

**LTE - Band 13****- Maximum tune up tolerance**

| Frequency Range<br>(MHz) | Output Average<br>Power to Antenna<br>(dB m) | Antenna<br>Gain<br>(dB i) | Power Density<br>at 20 cm<br>(mW/cm <sup>2</sup> ) | Limits<br>(mW/cm <sup>2</sup> ) |
|--------------------------|----------------------------------------------|---------------------------|----------------------------------------------------|---------------------------------|
| 777 ~ 787                | 25.70                                        | 1.48                      | 0.103 927                                          | 0.52                            |

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Note:

- The power density Pd (5th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm<sup>2</sup>.
- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
- This equipment should be installed and operated with minimum 20 cm between the radiator and your body.
- The antenna gain of this transmitter is less than 6 dBi and must not be collocated or operating in conjunction with any other antenna or transmitter unless authorized to do so by the FCC.

**Simultaneous transmission of MPE test exclusion for worst case configuration.**

Bluetooth: the ratio is 0.000 488 / 1

LTE Band13: the ratio is 0.103 927 / 0.52

Confirm the sum result of individual MPEs ratio is  $\leq 1.0$ ;

Bluetooth + LTE:  $(0.000\ 488 / 1) + (0.103\ 927 / 0.52) = 0.200\ 348 \leq 1.0$

So this device meets the KDB447498 D01 v06 section 7.2 requirement of "Simultaneous transmission MPE test exclusion"

Note:

- Between CDMA and LTE, LTE is chosen as worst case.
- CDMA and LTE do not transmit simultaneously.

**- End of the Test Report -**

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